



Test Procedure for the NCV47821 Evaluation Board

The NCV47821 is dual channel adjustable Low Dropout Regulator with:

- Two adjustable output voltages from 3.3 V to 20 V
- Two adjustable current limits up to 300 mA
- Enable inputs with 3.3 V Logic compatible thresholds
- Diagnostic Features:
 - Short To Battery (STB) and Open Load (OL) in OFF State
 - Internal Components for OFF State Diagnostics
 - Open Collector Flag Output

For detailed information read the technical specification.

Power supplying of the chip is possible from one or two independent sources. **INPUT1** must be always supplied and **INPUT2** as optional for V_{in2} supply.

Basic procedure of function verification, Diagnostic Functions inactive

1. Power supplying

a. Power supplying from one source

Connect the test setup as is shown in **Figure 1** (See **Table 1** with required equipment). Connect power supply to **INPUT1** connector **J₁** (Power supplying of **INPUT2** is not needed).

- **Hi_F** – Positive Force line
- **Hi_S** – Positive Sense line
- **Lo_F** – Negative Force line
- **Lo_S** – Negative Sense line

Connect V_{in2} pin to **INPUT1** via appropriate position of jumper “ V_{in2} to IN1 or IN2 connection”.

b. Power supplying from two sources

Connect the test setup as is shown in **Figure 1** (See **Table 1** with required equipment). Connect two power supplies to **INPUT1** connector **J₁** and to **INPUT2** connector **J₂**, respectively.

- **Hi_F** – Positive Force line
- **Hi_S** – Positive Sense line
- **Lo_F** – Negative Force line
- **Lo_S** – Negative Sense line

Values of input voltages V_{in1} and V_{in2} can be different. This option is suitable for reducing of power dissipation on chip.

Connect V_{in2} pin to **INPUT2** via appropriate position of jumper “ V_{in2} to IN1 or IN2 connection”.

2. Current Limit settings

Connect jumpers **J₁₀ – J₁₃** for output current limitation from V_{out1} pin and **J₂₀ – J₂₃** for output current limitation from V_{out2} pin.

- **J_{n0}** – $I_{LIMn0} \sim 17$ mA
- **J_{n1}** – $I_{LIMn1} \sim 170$ mA
- **J_{n2}** – $I_{LIMn2} \sim 280$ mA
- **J_{n3}** – I_{LIMn3} – R_{CSOn3} positions available for individual current limit setting by resistor from range 850 Ω to 25.5 k Ω

3. Diagnostic Function (inactive)

Connect **DE** and **CS** inputs to GND via appropriate jumper to disable diagnostic function.



4. Power ON

Set Input Voltage and turn on Power Supply/Supplies.

Enable output of the channel to power the regulated output voltage by connecting the **ENABLE** input to corresponding V_{in} via jumper. Enabling can be performed by external voltage source as well.

5. Load the outputs by resistive loads connected via jumpers:

- $J_5, J_7 - 22 \Omega$ ($I_{out} \sim 225 \text{ mA}$)

- $J_6, J_8 - 330 \Omega$ ($I_{out} \sim 15 \text{ mA}$)

External loads can be used instead build-in resistive loads as well.

6. Monitor Output Voltages, given according to Equation 1.

$$V_{out_nom_n} = 1.275 \left(1 + \frac{R_{n1}}{R_{n2}} \right) \quad (\text{eq. 1})$$

7. Monitor Current Sense Output voltages on appropriate connector. They should be max 2.55 V in steady state. The CSO voltages are proportional to output currents according to Equation 2.

$$V_{CSO_n} = I_{out_n} \left(R_{CSO_n} \times \frac{1}{100} \right) \quad (\text{eq. 2})$$

8. Compare your results with measured results in Table 2.

Table 2: Measured Results

Parameter	Test Conditions	Symbol	Value		Unit
			Nominal	Measured	
Output Voltage	$V_{in} = 13.5 \text{ V}, V_{out_nom_n} = 5.02 \text{ V}, I_{out_n} = 5 \text{ mA}, R_{CSO_n} = \text{Short to ground}$	V_{out1}	5.02	4.98	V
		V_{out2}		4.98	
	$V_{in} = 13.5 \text{ V}, V_{out_nom_n} = 5.02 \text{ V}, I_{out_n} = 200 \text{ mA}, R_{CSO_n} = \text{Short to ground}$	V_{out1}		4.99	
		V_{out2}		4.99	
Output Current	$V_{in} = 13.5 \text{ V}, V_{out_nom_n} = 5.02 \text{ V}, V_{out_n} = 90 \% \text{ of } V_{out_nom_n}, R_{CSO_n} = 15 \text{ k}\Omega$	I_{out1}	17	16.7	mA
		I_{out2}		16.8	
	$V_{in} = 13.5 \text{ V}, V_{out_nom_n} = 5.02 \text{ V}, V_{out_n} = 90 \% \text{ of } V_{out_nom_n}, R_{CSO_n} = 1.5 \text{ k}\Omega$	I_{out1}	170	169	
		I_{out2}		170	
	$V_{in} = 13.5 \text{ V}, V_{out_nom_n} = 5.02 \text{ V}, V_{out_n} = 90 \% \text{ of } V_{out_nom_n}, R_{CSO_n} = 910 \Omega$	I_{out1}	280	281	
		I_{out2}		281	
Output Current	$V_{in} = 13.5 \text{ V}, V_{out_nom_n} = 5.02 \text{ V}, V_{out_n} = 0 \text{ V}, R_{CSO_n} = 15 \text{ k}\Omega$	I_{out1}	17	17.3	mA
		I_{out2}		17.4	
	$V_{in} = 13.5 \text{ V}, V_{out_nom_n} = 5.02 \text{ V}, V_{out_n} = 0 \text{ V}, R_{CSO_n} = 1.5 \text{ k}\Omega$	I_{out1}	170	174	
		I_{out2}		174	
	$V_{in} = 13.5 \text{ V}, V_{out_nom_n} = 5.02 \text{ V}, V_{out_n} = 0 \text{ V}, R_{CSO_n} = 910 \Omega$	I_{out1}	280	289	
		I_{out2}		290	

9. Power OFF

Disable output of the channel by connecting the **ENABLE** input to **GND** via jumper. Or Turn OFF external voltage source.



Diagnostic Functions verification

1. Diagnostic Function (active)

Perform steps from 1 to 4 of Basic procedure of function verification and keep both channels disabled.

Short to battery detection (in OFF State)

Set **DE** input to **5 V** via appropriate jumper.

Set **CS** input to **GND**. If **EF** is **LOW**, Short to Battery on **CH1** event occurred.

Set **CS** input to **5 V**. If **EF** is **LOW**, Short to Battery on **CH2** event occurred.

Open Load detection (in OFF State)

Set **DE** input to **5 V** via appropriate jumper.

Enable detection by connecting the **ENABLE** input to corresponding V_{in} via jumper. Enabling can be performed by external voltage source as well.

Set **CS** input to **GND**. If **EF** is **LOW**, Open Load on **CH1** event occurred.

Set **CS** input to **5 V**. If **EF** is **LOW**, Open Load on **CH2** event occurred.

Combine selection $R_{CS01,2}$ and Resistive Loads. You can use external load as well.

Overcurrent detection

Set **DE** input to **GND** via appropriate jumper.

Enable output of the channel to power the regulated output voltage by connecting the **ENABLE** input to corresponding V_{in} via jumper. Enabling can be performed by external voltage source as well.

Set **CS** input to **GND**. If **EF** is **LOW**, Overcurrent on **CH1** occurred and CSO_1 output is **HIGH**.

Set **CS** input to **5 V**. If **EF** is **LOW**, Overcurrent on **CH2** occurred and CSO_2 output is **HIGH**.

Combine selection $R_{CS01,2}$ and Resistive Loads. You can use external load as well.

For supplying **DE** and **CS** inputs is used an 5 V LDO regulator U_2 powered from **INPUT1**.

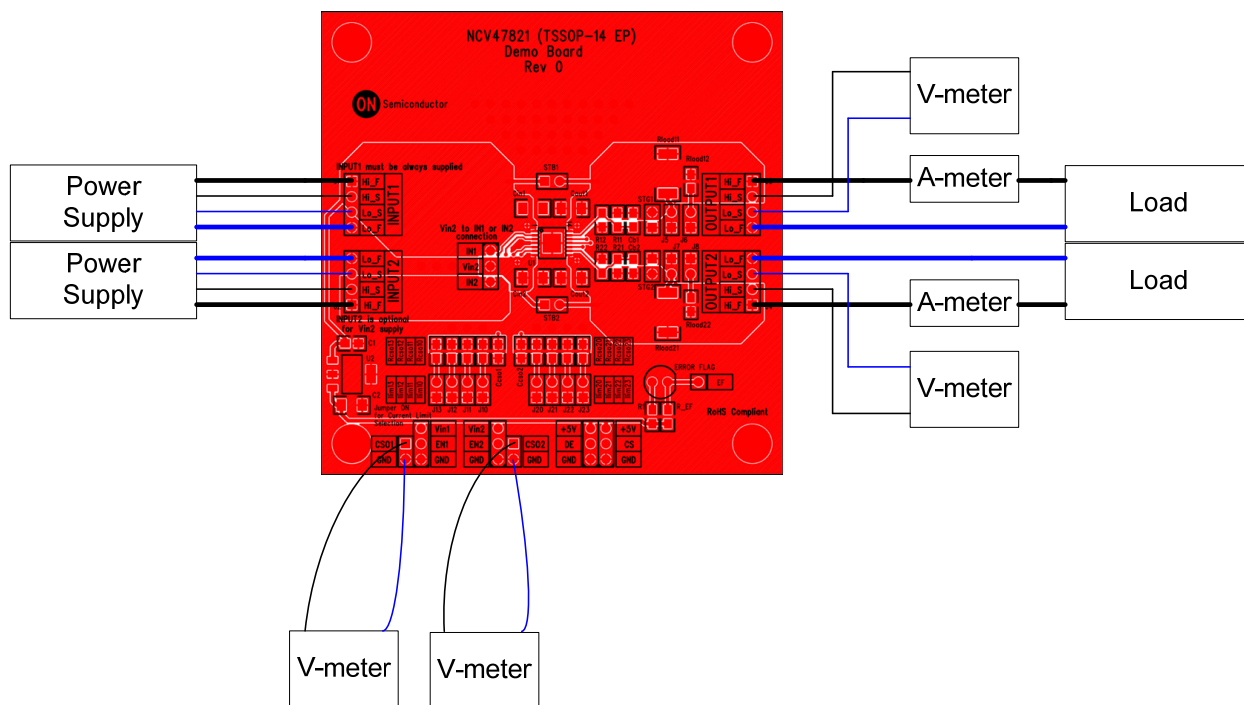


Figure 1. General Test Setup

Table 1: Required Equipment

Equipment	Ranges
Power Supply	0 V – 45 V / 2 A
Load	0 mA – 1 A
V - meter	0 V – 45 V
A - meter	0 mA – 1 A

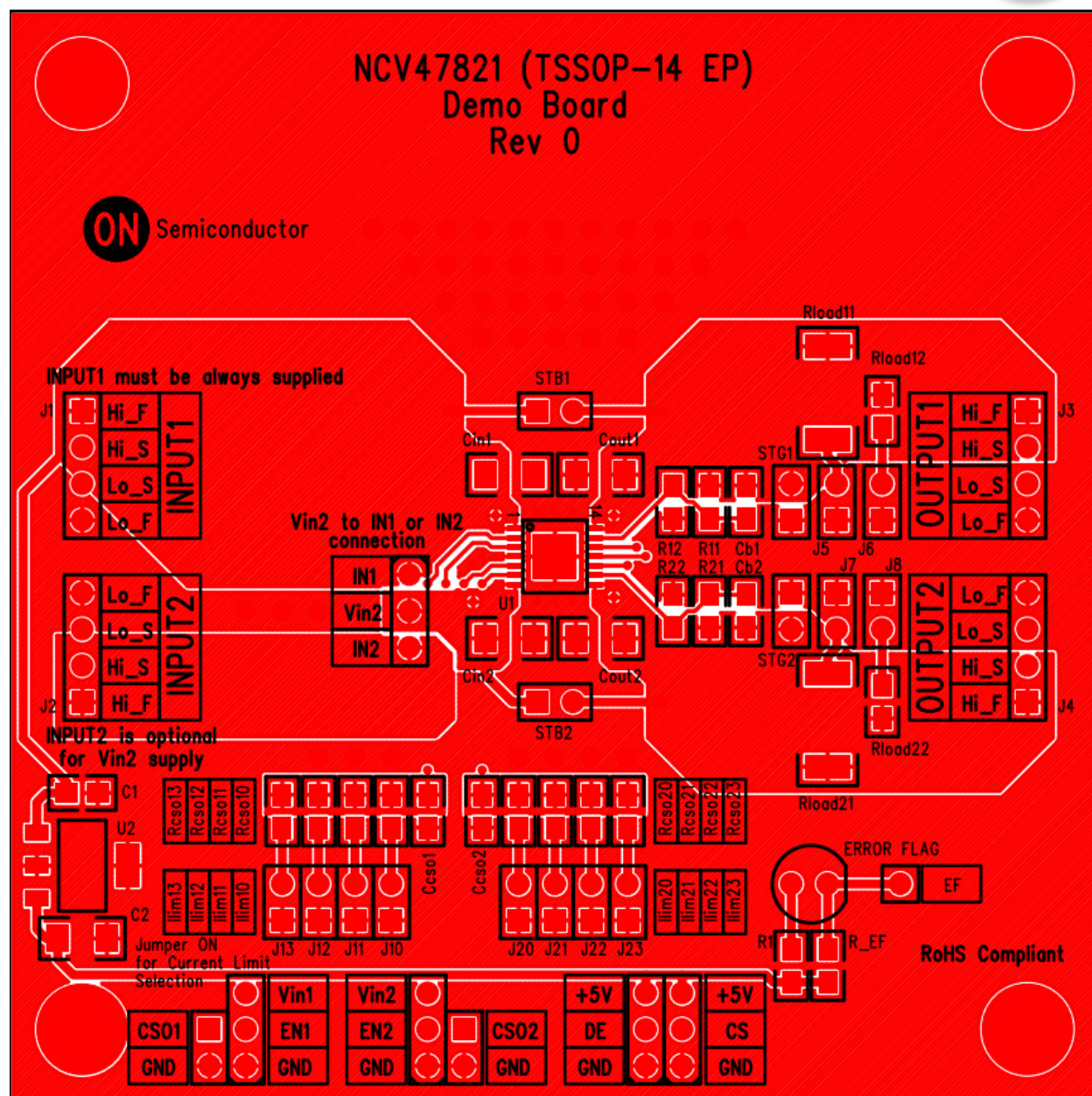


Figure 2. Top side PCB Layout (3 x 3 inch)